

## CLINICAL SYMPOSIUM

Prepared under the direction of EDGAR WAYBURN, M.D., *San Francisco*, and  
CLARENCE J. BERNE, M.D., *Los Angeles*

### Saddle Block and Caudal Block Analgesia for the Control of Pain in Labor

DR. KARL L. SCHAUPP, JR.:\*

CAUDAL anesthesia for control of pain in labor was started at Stanford Hospital about 1942. A satisfactory procedure using the catheter technique was developed, and we have used it in about 6,000 cases since then. With the advent of spinal anesthesia for delivery, and its growing popularity, we decided to investigate its possibilities although we were satisfied with the caudal technique. A series was started in January 1948, using spinal and caudal anesthesia for alternate nulliparas to see if superiority for one method or the other could be established. Spinal anesthesia has been used almost routinely for ten years in doing cesarian sections.

#### ANATOMY

The dissociation of the motor and sensory nerves of the uterus makes it possible to use such methods as spinal and caudal block during labor without interfering with the progress of labor. The sensory impulses are carried in visceral afferent fibers of the sympathetic system through the ganglia of the eleventh and twelfth dorsal segments. The motor impulses arise somewhere above the tenth dorsal segment. Motor and sensory nerves to the cervix and the lower uterine segment course through the parasympathetic plexuses and communicate with the second, third, and fourth sacral nerves. Somatic nerves to the vaginal canal and perineum originate in the sacral plexus. Thus it may be seen that a level of anesthesia to D-11 will block the pain of uterine contractions, cervical dilation, and vaginal and perineal distention while not interfering with contractions.

The only other anatomical consideration of note is the exaggeration of lumbar lordosis in pregnant women. This modifies the distribution of hyperbaric (heavier than spinal fluid) solutions given intraspinally in the lateral position with a change to the supine position immediately following. The level of anesthesia goes higher than desired unless the patient is put in a slight reverse Trendelenburg position.

#### TYPES OF SPINAL ANESTHESIA

As described by Adriani, there are five kinds of spinal blocks, if divided by spinal level:

1. *Saddle*, as the name implies, is essentially perineal analgesia with no motor changes in the legs.

2. *Modified Saddle* includes some sensory changes in the legs and a weakening, but not loss, of motor power.

3. *Low Spinal* is anesthesia to about the level of the umbilicus, with partial or complete paralysis of the legs.

4 and 5 are *Medium* and *High Spinals* with which we are not concerned here.

It is easy to see, on theoretical grounds, why the saddle and modified saddle blocks would not relieve the pain of uterine contractions, but would permit a low forceps delivery with episiotomy. This is actually the case. If relief from pain is desired, low spinal anesthesia with a level at least to the umbilicus must be obtained.

Lest the patient overhear and be alarmed by the word "spinal," obstetricians usually use the term "saddle block" rather than the more exact "low spinal anesthesia." As this is sometimes confusing to an anesthetist not familiar with the usage in obstetrics, perhaps it would be better to adopt the term "obstetrical saddle block."

#### TYPES OF CAUDAL ANESTHESIA

DR. RAPHAEL B. DURFEE:†

The techniques of caudal anesthesia are variations of one basic type of application of the anesthetic agent to the patient via the caudal space. There are several modifications of the original technique described for the procedure, but only the more commonly used ones will be discussed. The most generally used application is that described by Hingson and Edwards, who insert a special malleable needle into the caudal canal. This needle is connected to a metycaine ampoule by means of a sterile piece of rubber tubing, and the patient is placed on her back. Not long ago all such patients were placed on their sides following administration of the anesthetic, in order to prevent undue bending of the needle, but most observers have come to the conclusion that this makes little difference. It is generally felt that the moving of a patient with the needle in place increases the danger of needle breakage or displacement. To overcome this danger, we use special pliable catheters which are much more adaptable to obstetrical use than the malleable needle. These catheters are inserted through a 15-gauge needle into the caudal space, and are then taped into position and connected to the metycaine ampoule.

\*Teaching Assistant in Obstetrics and Gynecology.

†Clinical Instructor in Obstetrics and Gynecology, Stanford University.

The first use of the procedure in obstetrics was in the administration of the so-called terminal caudal procedure for anesthesia. By this is meant a single injection of the anesthetic as the end of the first stage of labor approaches, with the idea of using it as the procedure of choice during the actual delivery. Therefore, it is obvious that there is no reason for leaving an inlying trocar of any kind in the caudal canal. In the comparative studies of saddle-block and caudal anesthesia the caudal effects and results obtained with these single shot applications are the only ones truly comparable with those obtained with saddle-block. We definitely favor the use of an inlying catheter for caudal anesthesia when a long or continuous application is desired, whereas a single needle injection is more desirable for the single shot application. By either procedure, the area anesthetized is expected to be the same, although of course there will be a difference in the duration of anesthesia. The level of anesthesia will be somewhere between the umbilicus and symphysis, but while the prolonged application will afford complete relief of pain for the greater part of the first stage and all the second stage, the single application will give relief of pain in the second stage only.

#### PROCEDURES IN CAUDAL ANESTHESIA

When the cervix of a primipara is dilated to approximately 4 cm., or that of a multipara to 3 cm., and the patient is in good labor she is given 0.2 gm. of nembutal or seconal. Twenty minutes later she is prepared for the injection. She is placed in the prone position with the bolster directly under the hips to hold the gravid uterus off the bed as much as possible. The buttocks and sacral area are prepared with a solution such as tincture merthiolate or phemerol and the area is draped with sterile towels. The equipment is then set up, using a 200 cc. ampoule (Lilly) of 1.5 per cent metycaine in Ringer's solution. The caudal hiatus is palpated. Approximately 2.5 cc. of the solution is injected into the skin and about 2.5 cc. into the caudal canal itself. This procedure allows for painless insertion of the longer needle and also makes it much easier to be sure that the operator has inserted the needle in the proper place. The 15-gauge needle is then inserted into the caudal canal and the stylet removed.

Following this, approximately 8 cc. of solution is injected. Three minutes is allowed to pass in order that any possible untoward reaction may be noted. No injections are made at any time without trial aspiration with the attached luer in order to make sure that the needle tip does not lie within the spinal canal or a vein. If spinal fluid or blood is aspirated, the procedure should be stopped. (Fidelity in performance of this portion of the technique not only insures greater success but also immeasurably reduces the possible risk to the patient. Care at this point cannot be overemphasized.) A No. 4 catheter is then threaded through the needle to about the third mark and the needle carefully withdrawn, leaving the catheter in place. Here again, extreme

care must be taken not to advance the needle while the catheter is threaded through it or to pull the catheter out of the needle, for either could shear the catheter tip off against the sharp bevelled edge of the needle tip, leaving a portion of the catheter in the patient's body. These precautionary measures are not hard to follow when one becomes used to the technique.

The catheter is then taped in place and carried around to the patient's abdomen where, by means of a No. 23 needle, it is attached to the tubing leading from the ampoule of metycaine. As this is being done the patient is carefully rolled to her back and the bolster removed. Approximately 200 cc. more of solution is injected through the catheter. The patient is placed in semi-Fowler's position. Then the level of anesthesia is determined, the patient's blood pressure is checked, the fetal heart is auscultated, and a rectal examination is done to determine the progress of dilation. At this stage the patient has had a total of 30 cc. of metycaine. If the blood pressure drops below 80 mm. of mercury systolic, it may be easily raised by an injection of 0.5 or 0.25 cc. of neosynephrine. The fetal head may be a little higher than is normal, because of the patient's position over the bolster during the administration of the injection, but this will soon correct itself.

Additional amounts of the anesthetic agent may be given easily when the pain-relieving effect of the anesthetic diminishes, and should be given at the first complaint of discomfort. Usually 20 cc. is sufficient to continue adequate relief of pain for an hour or more. The solution is injected through the catheter by means of the syringe and stop-cock attachments connected with the metycaine ampoule. It is not necessary to move the patient again except to adjust the bed so that she is supine while the injection is being given and restored to the semi-Fowler's position when it is completed. By this means the first and second stages of labor may be conducted satisfactorily for some time.

#### DR. SCHAUPP:

*Equipment* needed for spinal anesthesia in obstetrics is the same as is needed in the administration of spinal anesthesia for any purpose. In our series we have been using "heavy Nupercaine," which is 5 mg. of Nupercaine in 2 cc. of 5 per cent glucose.

*Time of injection*—The time should be gauged so that while relief of pain is provided for as long a time as possible during labor, adequate anesthesia remains for the delivery. It varies with the agents used for anesthesia, the parity of the patient, and the progress being made in labor. In general, it may be given to a primigravida when the cervix is a rim, and to a multipara when the cervix is dilated to 6 cm. and good progress is being made. If the anesthetist knows the probable duration of anesthesia, by estimating the duration of labor remaining he can gauge the time for injection. We have found that 2.5 to 5 mg. of Nupercaine will last two and one-half to three hours. If anesthesia wears off too soon, however, a second injection may be made. One

patient in our group received three injections before the child was delivered.

Analgesia during the first stage of labor, before the spinal injection is given, is obtained in the usual case with Demerol 100 mg. hypodermically once or twice, and Nembutal 0.2 gm.

*Achieving a Level*—All the lumbar interspaces have been used as the site of injection. We use the fourth, since it is the one with which most anesthetists are familiar and a good level of anesthesia can be obtained.

There are many ways of achieving a level in the hands of trained anesthetists, but the obstetrician is interested in a standardized, simple procedure which will produce the desired result. The one currently popular is to use solutions of anesthetic agents heavier than spinal fluid (hyperbaric) in the sitting position, and to give the injection rapidly in 2 to 3 seconds. The patient is held upright by an assistant for 30 seconds. She is then laid flat with her head up on a pillow to prevent the solution from reaching vital centers in the medulla if by chance it should go up. A common error is to give the injection too slowly, with the result that the solution is pooled low in the spinal canal. This gives a true saddle block, but will not relieve labor pains. The injection should not be given during a uterine contraction, as currents set up in the spinal fluid by the contraction carry the anesthetic to a dangerously high level. Too rapid injection, too much solution, and the Trendelenburg position all may give high levels. When the procedure is properly done, the level of anesthesia reaches the umbilicus and the pain of uterine contractions is relieved completely. Motor power may or may not be present in the legs; the sphincter ani is relaxed. The relaxation and relief from pain seem to affect the cervix by allowing it to dilate more rapidly and thereby shorten labor.

*Drugs Used*—Varying amounts of many drugs have been reported by different authors. Following are some common doses: Procaine 50 mg. (crystals) in 2 cc. of spinal fluid. Metycaine 22.5 mg. (1.5 cc. of 1.5 per cent Metycaine used in caudal injections). Pontocaine 5 mg. (mix 2 cc. of 10 per cent glucose with 2 cc. of 1 per cent Pontocaine solution. Discard all but 1 cc.) Nupercaine 2.5 to 5 mg. (1 or 2 cc. of solution which comes already mixed with 5 per cent glucose.)

Mixtures of drugs with adrenalin or ephedrine are now being used successfully to prolong anesthesia, but we have had no experience with this in the obstetrical department.

#### DELIVERY

In the usual case, delivery is accomplished with forceps. They are used to lift the head over the perineum since the bearing-down reflex is abolished by the spinal or caudal, and the head rests there until the block wears off. Occasionally, delivery can be accomplished spontaneously over a relaxed perineum or with a deep episiotomy, but the patient must bear down voluntarily or fundal pressure must be

used. Rarely, with exceptional uterine contractions, the baby may be delivered with no other assistance. If the patient is in bed, and alone in a room, she may not know what is occurring, and the baby can be lost. For this reason, patients in whom dilation is complete should be checked frequently.

The incidence of the need for rotation of the baby is higher than in ordinary deliveries, but the rotation is easily accomplished owing to the relaxation of the soft parts of the perineum and the levator ani muscles. This relaxation, incidentally, may explain the failure of spontaneous rotation in many cases. If a second stage of one hour is allowed, usually the head will rotate and descend to the perineum. Breech delivery may be accomplished with the patient under spinal or caudal block alone, but if intra-uterine manipulations are required a deep anesthesia by ether may be necessary to relax the uterus. Podalic version of the infant should probably not be attempted with either saddle or caudal block alone.

Episiotomies are done routinely on all primigravidas, and on all multiparas who need it. The infants usually cry as soon as the head clears the perineum, and as there is no interference with uterine contractions, blood loss is minimal.

#### DR. DURFEE:

*Obstetrical Advantages*—The advantages of obstetrical anesthesia of this type are numerous:

1. Complete relief of pain throughout the first and second stages of labor.
2. Absence of need for additional anesthesia.
3. Shortening of the first stage of labor.
4. Exercise of control in operative obstetrics.
5. Facilitation of all operative obstetrical procedures.
6. Provision of a previously established anesthesia for most obstetrical emergencies and any procedures that may arise for taking care of them, including cesarean sections.
7. Delivery without the influence of narcotic drugs or inhalation anesthesia. (For this reason it is especially recommended for delivery of premature infants.)
8. Less loss of blood.
9. Prevention of excessive tension against the cord in a situation where the cord is short or foreshortened by malplacement around the fetal head.
10. Prevention of birth trauma to maternal tissues by allowing for complete relaxation of the tissues of the birth canal.
11. Reduction of the incidence of precipitate deliveries.
12. The patient is happy, awake, and in excellent physical condition.
13. Preservation of uterine tone and prevention of third stage uterine atony.
14. Ease of early artificial rupture of membranes.
15. Use in patients in heart disease, general debility, pulmonary diseases, upper respiratory infection and toxemia of pregnancy.

16. Improved morale of patient, staff, and relatives.

17. Ease in diagnosis of dilation and of the position of the fetal head.

18. Allowance for prolonged second stage without undue effect on baby or mother.

19. Shortening of postpartum convalescence.

#### SPINAL ANESTHESIA IN CESAREAN SECTIONS

##### DR. SCHAUPP:

Spinal anesthesia has been used for cesarean sections at Stanford University Hospital for many years with most satisfactory results. The injection usually is given with the patient in the lateral, slightly reverse Trendelenburg position to prevent too high a level. Many drugs have been used, but at present the anesthesia department usually uses Pontocaine in doses of from 5 to 15 mg. weighted with 10 per cent glucose, the variation depending upon the views of the individual anesthetist. Ephedrine 50 mg. hypodermically is given routinely.

#### CAUDAL ANESTHESIA IN CESAREAN SECTIONS

##### DR. DURFEE:

We have used the caudal technique for cesarean sections, but not as often as spinal anesthesia nor with as great over-all success. In most instances the caudal was started for what appeared to be normal labor. Some patients required accessory anesthesia because of incomplete relief of pain, but in many cases nothing additional was needed but oxygen for the child. In giving a caudal anesthetic for cesarean section the best method is to give it 30 to 45 minutes before operation to insure a proper level of anesthesia. This often requires 10 to 15 cc. more as a total dose than is needed for normal delivery. If the operative procedure should be prolonged, the advantage of continuous application is obvious. On the whole, for routine elective cesarean sections spinal anesthesia is preferable to caudal because of simplicity of technique.

#### COMPLICATIONS AND CONTRAINDICATIONS

##### DRS. SCHAUPP AND DURFEE:

The most important added consideration in both spinal and caudal anesthesia is the presence of the fetus, which is susceptible to prolonged hypotension and to anoxemia. A systolic blood pressure of 80 mm. of mercury in the mother is considered necessary to prevent fetal distress, as it takes this much pressure to maintain adequate circulation for the placenta. Consequently, a careful, regular check on the mother's blood pressure is necessary following the injection. Treatment for hypotension consists of the administration of Neosynephrine 2 mg. hypodermically, or ephedrine 25 to 50 mg. hypodermically. Elevation of the legs to put pooled blood back into the circulation is resorted to in extreme cases or emergencies, with care taken not to raise the level of anesthesia above that normally allowed by spinal injection. In our series the incidence of hypotension requiring treatment was 17.3 per cent in the cases

in which spinal anesthesia was used, and 12.9 per cent in the patients given caudal anesthesia.

The level of anesthesia must be checked, as a high level will paralyze the muscles of respiration and may cause anoxemia. As the fetus may be affected by anoxemia in the mother, permanent damage to the baby can result. The fetal heart reflects such changes by changes in pulse rate, usually a slowing. Pulse rates of 80 to 90 per minute are not unusual. The same phenomenon is observed in the case of hypotension. Response to adequate oxygenation or raising the blood pressure of the mother is usually prompt. Deep breathing, pure oxygen, and artificial respiration are used—in that order—when necessary.

In giving an anesthetic by the caudal route, care must be taken against massive intravenous injections. As a precautionary measure, aspiration should be done before the solution is injected. If spinal fluid appears, it is best to abandon the procedure. If blood is aspirated readjustment of the needle usually will correct the situation and permit going ahead with the procedure.

Headaches in the postpartum period usually occur in 8 to 10 per cent of the patients given spinal anesthesia. The incidence in our series has been 8.68 per cent. Headache usually appears on the second or third day and is not very severe, lasting only 24 to 48 hours. Treatment varies greatly, no one remedy being entirely satisfactory.

Bladder dysfunction (residual urine and inability to void) may occur in postpartum patients who have received neither spinal nor caudal anesthesia, but the incidence is higher when these methods are used. In our series, it was 0.86 per cent in patients who had had caudal, and 6.5 per cent in those who had had spinal anesthesia. Recently the incidence of bladder dysfunction has been lower as a consequence of improved technique. In none of the cases was the hospital stay prolonged because of this complication. Treatment consisted of catheterization as necessary or continuous drainage through an indwelling catheter and chemotherapy given prophylactically.

Neuropathy may occur following spinal anesthesia, and since the damage may be in the central nervous system, it may be permanent. Damage to the nervous system that may be caused by giving a caudal anesthesia, on the other hand, will affect only peripheral nerves and will usually clear up.

Contraindications to the giving of either caudal or spinal anesthesia include diseases of the nervous system, sepsis, spinal arthritis, skin infection near the site of puncture, shock, long-standing headache (this applies to spinal anesthesia only), and idiosyncrasy to the drugs used. Patients with hypertension must be watched with extra care as the fall in blood pressure may be excessive, and the response to pressor drugs more rapid and extreme than desired. A pilonidal cyst, whether it has been operated upon or not, is considered an absolute contraindication to caudal anesthesia. The prospect of long,

difficult labor should make one not too familiar with these procedures hesitate to use them except for the delivery itself. Given too soon, particularly if labor is desultory, either caudal or spinal anesthesia can inhibit labor.

#### COMMENT

For the average practitioner, anesthesia by spinal injection is the procedure of choice. He is familiar with it, as is the staff of his hospital. Relatively little study and practice are required to apply it in obstetrics. The patient is awake at the time of delivery and the infant is not under the effect of the anesthetic agent. Patients appreciate being awake to hear and see their offspring immediately.

For the patient, caudal anesthesia is the procedure of choice. It can be maintained for about 12 hours and therefore can be given earlier in labor. This decreases the amount of other medication necessary in the first stage of labor. The procedure does not cause headache. If neuropathy should occur, the chance of recovery is excellent since the anesthetic agent is applied only to the peripheral nerves. The advantages in delivery are the same as for spinal anesthesia.

Finally, it must be remembered that, in either procedure, someone familiar with the procedure, with the complications that may result, and with the treatment of them must be in constant attendance after the anesthetic agent is injected.

